

U.S. ARMY FIELDING OPTIONS FOR
THE OBJECTIVE FORCE WARRIOR

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ABSTRACT

U.S. ARMY FIELDING OPTIONS FOR THE OBJECTIVE FORCE WARRIOR, by
Major Roderick Hammond,

Thesis: Given its current procurement timeline, will the Objective Force Warrior's fielding options provide the light infantry unit with the capability to defeat an adaptive enemy on an increasingly asymmetrical battlefield?

Over the course of the last decade, the Department of the Army (DA) has made a concerted effort to increase the capabilities of the infantry soldier. A few improvements include better small-arms and crew-served weapon ranges, enhanced weapon sight optics, smaller and lighter communications equipment, and night vision detection devices. All of these innovations were gradually introduced into the Army infantry inventory as incremental improvements to supplement current training, doctrine, and force capabilities.

Objective Force Warrior is an integrated soldier fighting system for the light infantryman that is being designed to increase the fighting capabilities of the infantry soldier. It has several subsystems. These include the weapon, helmet assembly, protective clothing, and computer-integrated, radio-receiving unit. The entire unit is coordinated by a computer-processing unit which will integrate into the digital battlefield of the future Objective Force.

The program is being developed with three priorities: lethality, survivability, and enhanced command and control; and the premise is that technology will allow the system to be fielded by 2008 with modular upgrade capability. This thesis analyzes three options for fielding the Objective Force Warrior using system design perimeters as outlined by General Shinseki's 1999 vision statement for the objective force.

ABBREVIATIONS

C4	Command, Control, Communications, and Computers
COP	Common Operating Picture
DOD	Department of Defense
DA	Department of the Army
FoS	Family of Systems
FY	Fiscal Year
FCS	Future Combat System
HUD	Heads Up Display
ISR	Intelligence, Surveillance, and Reconnaissance
JRTC	Joint Readiness Training Center
LW	Land Warrior
LWSI	Land Warrior Stryker Interoperability
LWS	Land Warrior System
OF	Objective Force
OFW	Objective Force Warrior
O&O	Operational and Organizational Plan for the Unit of Action
ORD	Operational Requirements Document for Future Combat Systems
R&D	Research and Development
RMA	Revolution in Military Affairs
S&T	Science and Technology
SA	Situational Awareness
SU	Situational Understanding

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CHAPTER 1

INTRODUCTION

Capabilities associated with the tools of war will improve, and combat techniques will reflect these changes. But fundamental to the realization of any improvements in technology, techniques, operational concepts, or strategy will be the capacity of the Soldier to bear the hardships of combat and adapt to mission demands. (FM 1-0 2001, 35)

Over the course of the last decade, the Department of the Army has made a concerted effort to increase the capabilities of the infantry soldier. A few improvements include better small-arms and crew-served weapon ranges, enhanced weapon sight optics, smaller and lighter communications equipment, and lower-light-level night vision devices. All of these innovations were gradually introduced into the Army infantry inventory as incremental upgrades to supplement current training, doctrine, and force capabilities. On 12 October 1999 General Shinseki, Chief of Staff of the Army, issued his vision for creating a future combat force that is strategically responsive and dominates at every point on the spectrum of conflict. This perspective became the Army's vision of how future forces must be structured and with what type of equipment will be required to operate on the modern battlefield. Significant to this vision is the concept of upgrading each type of army unit as a complete packaged and integrated system. Now, it seems that the Army will no longer focus on single-point requisition processes to keep its fighting force on the cutting edge. This new force structure termed the "Objective Force," will be built from the ground up with the soldier as the core integrator fusing maneuver combat vehicles, digital wireless command and control cells, and ground tactical infantry units.

General Shinseki's vision required a plan that would transform the Army into "a force that is responsive, deployable, agile, versatile, lethal, survivable, sustainable, and dominate at every point along the spectrum of operations, anywhere in the world"(Cox 2002, 14-15). This transformation will spread over twenty years and includes molecular changes in force structure and equipment design. To develop the Objective Force, several major programs will be created. The Objective Force is based on the concept of integrated systems delivered to the battlefield by a series of combat vehicles belonging to the Future Combat System - Family of Systems (FCS - FoS). The system earmarked for the modern infantry man is the Objective Force Warrior. This system is a subset of the FCS FoS and is a culmination of technological enhancements integrated into a wearable suite designed to improve the combat effectiveness of ground forces. The FCS and Objective Force Warrior represent the two largest budget expenditures of the Army's research and development program (Stouder 2002, 140).

To determine the end state of the Objective Force, the Army must fully understand its capabilities and global applications, as well as implications for use on the future digital battlefield. This progression from present to future is nonlinear and requires an approach that balances war fighting with politics and technology. Technology, in the latter half of the twentieth century, became a central characteristic of how America decided to wage war. During World War I, it was not the products that were technology infused, but rather the processes that allowed the military to mobilize through the means of mass production and the manufacturing processes. However, by World War II the emphases moved to developing and producing more superior American military equipment, primarily in the area of air and sea combat capability.

This progression of technology did not halt with end of World War II. The Vietnam War may have been politically motivated; but no one can dispute the role technology played with the introduction of the helicopter in supporting U.S. ground forces. This is an example of how technology made the military more responsive to enemy threats, as well as provided enhancements to logistic, medical, and command operations. Operation Desert Storm in 1991 marked, perhaps more than any other conflict, the transition to a high-technological military posture (O'Hanlon 2000, 1). The use of laser-guided munitions, self-tracking and aligning missiles, and stealth aircraft is indicative of that posture. With these historical trends and the ever-present threat of future conflict and U.S. policy challenges, many American defense analysts have recently proposed that a revolution in military affairs is either underway or within reach and that the United States needs to be aggressive about pursuing it (O'Hanlon 2000, 2). With the publishing of *The Army Vision, Joint Vision 2010*, and General Shinseki's *U. S. Army White Paper: Concepts for the Objective Force* it is apparent that the Department of the Army has undertaken serious consideration in applying various aspects of Revolution in Military Affairs theory to provide cause for implementing major tenets of the Objective Force. This leads to the implication that the Objective Force was born out of the thought that technology will increase exponentially to allow an increase in military capability. This growth prediction also allows project managers, force planners, and contracting agencies the capacity to meet Department of Defense (DOD) timelines for fielding these systems into organic organizations at prescribed future intervals (O'Hanlon 2000, 3).

General Shinseki, recognizing the Objective Force requires understanding and building on the human dimension, saw the need for a component of the transformation

effort to be specifically focused on the soldier. As a result, three separate groups were chartered to develop and review visions and concepts for the Objective Force Warrior. An independent review team recommended that the Objective Force Warrior could yield a revolutionary capability this decade. They also found the greatest opportunities for performance gains were beyond 2012 (*Report of the Deputy Assistant Secretary of the Army* 2001, 1).

Objective Force Warrior is an integrated soldier-fighting system for the light infantryman. It has several subsystems. These include the weapon, helmet assembly, protective clothing, and receiving unit. The entire unit requires an integrated computer processing unit and software to integrate all of the subsystems. The program is being developed with three priorities--lethality, survivability, and enhanced command and control. Objective Force Warrior is an Army flagship program focused on providing the future soldier and small team improved and unparalleled capabilities on the future battlefield. According to Michael Andrews, deputy assistant secretary of the Army (research and technology), "Our challenge is to help them be the most survivable and lethal soldiers in the world; to complete their missions with a goal of a 40-pound fighting load in all terrain and weather conditions with a long term goal of getting the Soldiers' fighting load to 15 pounds" (Hannah 2002).

The Objective Force Warrior is not the only ground warrior system under development. The Army's infantry combat development center, located at Fort Benning, Georgia, has pioneered research and development of the Land Warrior (LW) Program for the past eight years. The projected capabilities of the two systems have many similarities. The Objective Force Warrior program, however, represents a technology leap forward of

the capabilities of the Land Warrior. The Army's current force structure is the Legacy Force. The LW is viewed as the initial entry system for the legacy force as it transforms into the next phase known as the Interim Force. The LW is scheduled for fielding in 2004. Due to parallel development, the Objective Force Warrior is expected to debut its first deployable model by 2010. However, contractors are currently anticipating fielding as early as 2008 (Cox 2002, 15). This transition from LW to Objective Force Warrior is also indicative of the Army's force transformation as it evolves into the Objective Force. It is important to point out that both the LW and Objective Force Warrior are under development by separate teams with competing resources and different oversight organizations.

Why does the Army need the L/Objective Force Warrior? The capabilities of U.S. adversaries, just as the U.S., are constantly changing. The U.S. can logically deduce that enemy technical and tactical capabilities will increase in proportion to its own. This does not mean they are developing an equivalent Objective Force Warrior System, only that they are learning to counter U.S. doctrine, tactics, and technology based on observation and firsthand experience. In essence, they are more aware of their vulnerability to U.S. detection and precision air strikes. The Army's future enemies will avoid massing their forces in linear offensive and defensive echelons. Instead, they will attempt to employ selective strikes to inflict casualties, to conduct rapid maneuver from safe areas, to engage in terrorism, and to incite public unrest. All of these things represent an enemy growing in asymmetric capabilities whose actions are aimed at destabilizing allies and attacking U.S. interests worldwide (Eaton 2002, 1). Another tool of this adaptive enemy is creating a perception of U.S. vulnerability by striking targets using terrorist or guerrilla

tactics that are unconventional and unmilitary in nature. With this perceived vulnerability and increase in military and civilian casualties, the enemy expects to influence world opinion through diminished political power by attempting to curtail other nations from using military force.

The Army must also be aware of technology access. No longer can the U.S. expect to corner the market on the exclusive use of developing technologies. The worldwide proliferation of the means to produce and acquire technical equipment is no longer a U.S. luxury. For example, cell phones are available on every corner store in every country of the world. When cell coverage is available, it allows for instant intelligence reporting from any location. Night vision devices can be ordered from many technology stores to include Radio Shack and Sharper Image (Bourgeois 2002, 34). Computers, weapons, scopes, and communications equipment can be ordered from many internet sites or even Ebay. In addition, the black market has always been a source to acquire military equipment, especially explosive ordinance. Using commercial sources to attain military capacity comes as no surprise, because the Army, in an attempt to decrease costs and shorten development time, is using many off-the-shelf parts to develop the LW.

The Objective Forces is expected to operate at the strategic, operational, and tactical levels of war. The Objective Force Warrior will focus on action at the tactical level.

Without tactical success, a campaign cannot achieve its operational goals. An essential element of operational art, therefore, is the ability to recognize what is possible at the tactical level. (FM 3.0 2001, 2-4)

The Objective Force Warrior is one of the cornerstones of the Objective Force strategy, complementing the FCS program. At the tactical level, Objective Force units

will see first, understand first, act first, and finish decisively as the means to tactical success (Shinseki 2001, 6). An integrated system of systems approach is being employed to support the Army transformation to a soldier-centric force.

To defeat an enemy who is adaptive, less technical, and learned in asymmetrical tactics, the Army must retain its edge of adaptive dominance (Eaton 2002, 2). The goals of adaptive dominance: to find, fix, and destroy the enemy by any means, under any condition. The purpose of the Objective Force Warrior program is to allow the infantry to achieve adaptive dominance when dealing with an adaptive enemy steeped in asymmetric warfare by retaining agility and the initiative. Due to the nature of Combat Training Centers (CTCs) the enemy has the home field advantage. The Objective Force Warrior program will remove this advantage to allow the infantryman to take the fight to the enemy across the full spectrum of conflict. The Objective Force Warrior program is the progression of technology to increase the infantry soldier's effectiveness, lethality, and capabilities on the modern battlefield. However, after-action reports from the CTCs indicate that an enemy possessing lower technology is able to frequently gain surprise and initiative over friendly rotating forces. As a result, the opposing force can inflict a disproportionate number of casualties against friendly units rendering them combat ineffective. Despite the apparent technological edge of infantry brigade and battalion task forces, these units are experiencing difficulties in dealing with relatively unsophisticated enemies during role plays at the CTCs, as well as worldwide deployments.

Objective Force Warrior notional concepts seek to create a lightweight, overwhelmingly lethal, fully integrated, individual combat system, including weapon, head-to-toe individual protection, netted communications, soldier-worn power sources,

and enhanced human performance. The program is aimed at providing unsurpassed individual and squad lethality, survivability, communications, and responsiveness--a formidable warrior in an invincible team. Objective Force Warrior will also be developed to fully integrate with FCS. The system's design is based upon five concepts as outlined in program goals: (1) lethality--Objective Force Warrior family of lightweight weapons with advanced fire control, optimized for urban combat, and synchronized direct and indirect fires from Future Combat System; (2) survivability--ultra lightweight, low bulk, multifunctional, full-spectrum protective combat ensemble; (3) sensors and communications--netted Objective Force Warrior small unit/teams with robust team communications, state-of-the-art distributed and fused sensors, organic tactical intelligence collection assets, enhanced situational understanding, embedded training, on-the-move planning, and linkage to other force assets; (4) continuous operations--72-hour continuous autonomous team operations, high density, low weight/volume, self-generating/re-generating, reliable, safe power source/system; and (5) mobility, sustainability and human performance--unconstrained vertical and lateral movement at full-up combat/assault capability during mission execution. In addition, the system will offer optimized cognitive and physical fight ability using onboard physiological/medical sensor suite with self-diagnostic and care implementation (Natick Soldier Center, 2002).

One underlying assumption concerning this research is that the capabilities of the Objective Force Warrior will accurately match the design specifications of the current project while maintaining the current forecasted field dates. Light infantry soldiers are constantly under scrutiny for equipment weight and load configuration. The goal of the Objective Force Warrior is to reduce the fighting soldier's load to fifty pounds (Cox

2000, 19). Producing an effective system that weighs only fifty pounds, that is ready for employment as early as 2008, represents a significant challenge to research and design teams. More significant is the assumption that battery power will not induce substantial logistical requirements, thus forcing resupply windows to drive combat operations. Today's computer users are accustomed to "plug-and-play" compatibility from one computer system to another. Terrorist threats and asymmetrical elements of warfare are necessitating more joint operations to counterbalance the strength and weaknesses of different force types. The Objective Force Warrior must be interoperable across multiple movement platforms and service structures. This is a must-have requirement to get a 360-degree "field of view" of the future battlefield for the Objective Force (Cox 2000, 14).

The challenge of a transitioning army is to remain ready for war across the full spectrum of conflict while performing a myriad of tasks that are largely unrelated to traditional war fighting. Why is it important to argue the usefulness of the Objective Force Warrior system? Just as the Army must be ready to meet the nation's enemies on the field of battle, the military has an obligation to provide an effective system of protection to increase the survivability of the frontline soldier. Based on independent study groups, new technology and tactical innovations have considerable potential to make important contributions to warfare by 2015. But, with the ever-increasing evolution in technology, it may not, by natural progression, provide viable solutions to problems of the past. Take for example an enemy establishing a hasty ambush on a seemingly less-traveled trail. The successfulness of the Objective Force Warrior relies on the ability to receive timely sensor or networked information, as well as distributed battlefield update information. Once all of the different sources of information are digested, the enemy may

still have the initiative due to the volume of information that must be processed or because of poor sensor capability of the Objective Force Warrior. This means combat, doctrine, and tactics may, in many ways, remain similar to its current form. It also casts doubt on the assumption that a Revolution in Military Affairs is underway and that a major transformation of the U.S. military is now required to follow suite (O'Hanlon 2000, 7).

Will the fielding options for the Objective Force Warrior provide the light infantry unit the capability to defeat an adaptive enemy on an increasingly asymmetrical battlefield? If so, what aspects of tactics and information management must be addressed to account for the man and his machine? Will this evolution in technology cause or lead to a revolution in doctrine?

This thesis will look to examine the questions at hand in two contexts. A historical context to examine whether there is enough evidence to suggest that technology will exponentially increase to advocate that the capability will exist to support development of the Objective Force Warrior based on current Revolution in Military Affairs theories. Second, based on the characteristics of the Objective Force design from the white paper: agile, versatile, lethal, survivable, and trained, this thesis will assess the aspects of tactics and doctrine an infantry Objective Force unit may need in order to defeat an adaptive enemy on an increasingly asymmetrical battlefield.

CHAPTER 2

LITERATURE REVIEW

The majority of documentation addressing the Objective Force (OF) and its warrior program can be found in General Shinseki's *U. S. Army White Paper: Concepts for the Objective Force* and *The Army Vision*. Buzz words, such as "full-spectrum dominance" and "information-centric" have propagated through many Army manuals to include Field Manual 1, *The Army*. This does not mean that there are library stacks of information on the OF available to the public at this time. Rather, the majority of the available materials is articles from military periodicals, draft documents based on the acquisition design process, or briefs given from a particular agency.

To facilitate answering the thesis question and analyzing the collected data, it is best to segregate cited works into three topics: those covering the design or layout of the Objective Force/Objective Force Warrior, topics covering historical examples leading to the validation of Revolution in Military Affairs theories, and references that provide insight in explaining the implementation of OF capabilities into current tactics and doctrine.

Objective Force / Objective Force Warrior

The *U. S. Army White Paper: Concepts for the Objective Force* provides the overarching framework for the OF, its operational concept, and describes future requirements of leaders and soldiers to maximize operational capability of the unit of action. To account for a smaller force, weapons technology breakthroughs must provide significantly greater tactical, operational, and strategic lethality from smaller, more agile

forces. The role for advanced technologies is to empower soldiers and leaders to achieve situational dominance. Critical for the Objective Force Warrior will be the need to develop situations out of contact, maneuver into positions of advantage, engage enemy forces beyond the range of weapons systems; to destroy them with precision fires and maneuver, and to decide when to tactically assault the enemy. How will the Army maintain the edge over a constantly evolving enemy in the twenty-first century? The full-spectrum qualities of the OF will ensure both its long-term dominance over evolving, sophisticated threats with asymmetric capabilities and its continued relevance for the unpredictability of the evolving operation environment.

To define the future battlefield environment, the Army must define the enemy. The OF *White Paper* describes an enemy who possesses the capability to quickly mass, launch large-scale terrorist attacks, and then disperse rapidly. Perfecting its techniques of dispersing allows the enemy to limit exposure, delay intelligence collection, and complicate targeting processes. This means the enemy will seek refuge in areas where detection is difficult, and the characteristics of identity and individuality are muted by demographic similarities. These sanctuaries are located in complex, urban terrain that is shielded by civilians and culturally significant structures. The enemy will resort to decentralized, small-unit operations when it perceives that the OF has the advantage. When it has the advantage, the enemy will gain the offensive at hopes of obtaining military action before the OF has the ability to alert and deploy.

Dr. Mike Andrew, the Deputy Assistant Secretary of the Army for Research and Technology, published the Objective Force Warrior “Another Look” concept study. This purpose of this study was to provide a sample roadmap for technology integration of the

Objective Force Warrior program and to focus the Army's Science and Technology (S&T) program of the Objective Force Warrior. This study created a group consisting of four teams. Each team was asked to take an independent look at the vision, metrics, and enabling technologies for the Objective Force Warrior based on three questions: What capability is possible with a technology freeze in fiscal year (FY) 2006? How does the U.S. achieve a paradigm shift in warrior capability? and How significantly will the Objective Force Warrior exceed Land Warrior capabilities? (Report of the Deputy Assistant Secretary of the Army 2001, 2).

The teams were a mix of military, civilian, and contractors. The significance of this study was that it produced a composite vision of force capabilities, in accordance with current and near-term science technology. This will help in evaluating capabilities of the system without a working prototype as long as the assumptions of these capabilities hold throughout the design process. Prior to this workshop, no focus was given toward defining the capabilities outside of the *White Paper*. This team identified selected technology opportunities and provided a sample roadmap for technology integration. They also found the greatest opportunities for performance gains were beyond 2012. This suggests that a more appropriate date for fielding the Objective Force Warrior, based on technology and capability development, should be closer to 2018 to meet the goals of the program (Report of the Deputy Assistant Secretary of the Army 2001, 41).

To aid in the evaluation process, the Objective Force "Operational and Organizational Plan for the Maneuver Unit of Action" details proposed structures for the unit of action. More importantly, it details platoon and squad organizations, as well as infantry company tasks. In addition, operational concepts for the deployment of the Unit

of Action as well as doctrine, training, and leader development implications are presented.

Revolution in Military Affairs / History

Michael O'Hanlon, presents the theories of technological revolution in his book *Technological Change and the Future of Warfare*. This book examines in detail the currently popular hypothesis that may be possible to achieve a revolution in military affairs. Revolution in Military Affairs proponents believe that future militaries should attempt to achieve information dominance. They believe that future militaries will be able to depend on highly complex and integrated communications systems that enable them to fight and win on future battlefields (O'Hanlon 2000, 8). Many military historians who confide in the principles of warfare as outlined by Carl von Clausewitz (1780-1831) will find that Revolution in Military Affairs theories run in opposition in describing the outcomes of war. Clausewitz would argue that in war things break, seemingly easy activities become slow and difficult, initial battle plans must usually be discarded (Clausewitz, 1984, 23).

At the conceptual level, there are four Revolution in Military Affairs schools of thought: system of systems, dominate battle space knowledge, global reach and power, and vulnerability. The system of systems focuses on the potential of rapidly improving computers, communications, and networking systems to make existing weapons systems function in a much more integrated manner. The critical aspect of this school of thought is that future warfare will be dominated less by individual weapons platforms and munitions than by real-time data processing and networking that tie forces together in a battlefield network. A facet of this school is that computer capabilities will increase at an

exponential rate over time. This means, based on current estimates, they will increase in speed and capabilities every six months. Trends in computing power, speed, cost, and size have made it possible to put computers on ballistic missiles, fighter jets, and radars in the last few decades (O'Hanlon 2000, 12).

Dominant battle space knowledge hinges on the belief that sensors will make future battlefield data much better and more complete. Of all the Revolution in Military Affairs schools, this school focuses on breakthroughs not only in technologies, organizations, and capabilities, but also in intelligence, surveillance, and reconnaissance (ISR). A goal of this technology will be the ability to find, fix, track, and target enemy elements in near real-time resolution (O'Hanlon 2000, 13). The military has used handheld global-positioning satellite systems for years to assist in military and civilian navigation. This sensor technology, for example, has changed not only the military but also many aspects of society from cars to cell phones that identify the location of callers.

The Revolution in Military Affairs theories of global reach and global power envision the development of more lethal, agile, and deployable weapon systems and munitions over time and space. A tenant of this school of thought is that military forces must be able to deploy rapidly and decisively overseas within hours or, at most, days. They also understand that this will allow the U.S. to avoid forward-deployed, fixed bases in combat theaters. This theory requires the complete, unrestricted funding to an Air Force to provide quick, strategic lift and response. However, the concept of global reach and global power goes well beyond the Air Force. An extension of this school also suggests that ground combat units will be organized in radically different ways,

permitting them to deploy rapidly with only minimal amounts of equipment and supplies (O'Hanlon 2000, 15).

The final RAM school of thought, vulnerability, suggests that adversaries may benefit at least as much as the U.S. from technologies like ballistic missiles, satellite imaging, computer viruses, and weapons of mass destruction to name a few (O'Hanlon 2000, 12). Anyone who has read the book, *Black Hawk Down* based on the 1993 Somalia conflict may recall the use of cell phones by hostile belligerents to report the status of U.S. forces. Something as small, accepted, and common placed as the cell phone, even in a third world country, may become the backbone of a simple, but effective, intelligence network.

Tactics and Doctrine

While current field manuals, student texts, and course books provide solid structure to gain an understanding of how the U.S. currently fights, it is much harder to ascertain how the Objective Force will need to adjust current tactics and doctrine to fight an enemy who has also evolved to defeat emerging capabilities of the Objective Force. One way to develop an assessment of proposed changes in current tactics or doctrine for future war-fighting capabilities is to run battle simulations. After all, one tenant of planning is the ability to conduct virtual mission rehearsals.

"Lightning over Water" is just such a publication containing a series of simulations conducted by the RAND Corporation (RAND is a contraction of the term research and development) based on augmenting current light infantry forces to meet future war fighting needs. The scenarios are based on the fundamental question, How might light forces be changed to offer greater rapid-reaction capability? To answer this

question, three courses of actions (COAs) were developed to simulate operations in different combat environments. The COAs were: introducing maneuver to light forces, enhancing current light forces, and making light forces smaller and more dispersed. These three paths are simulated over many different environments to include desert and built-up urban areas. The result, cross-referencing the path with the environment may provide enough data to determine force structure for the OF and necessary capabilities of the Objective Force Warrior system based on mission and environment (Matsumura 2000).

Another way to predict the possible changes in tactics and doctrine is to look at current field test data for the LW system. Although not fielded until 2004, there have been field tests of the system, on limited bases, at the Joint Readiness Training Center (JRTC). A highlight of the field tests was published in the September 2000 issue of the *Army Times*. Even though the capabilities of the LW are two-to-three generations behind those projected for the Objective Force Warrior, however, trends noted at the tactical level may still have implications for the Objective Force Warrior. Colonel Glenn L. Burch of the Army War College presented “An Examination of Land Warrior’s Contribution to Combat Power on the Battlefield” based on the JRTC trials. He based his assessments, for the most part, on the elements of combat power: maneuver, firepower, protection, and command and control (Scaparrotti 2000, 18)/

Soldiers’ loads can dramatically affect the performance of tactical operations. The weight of the tested LW beta was approximately twenty-five pounds above that of the soldier’s gear. The current goal for the Objective Force Warrior is forty pounds fighting

load with the long-term goal of fifteen pounds. The Marine Corps has published many more documents researching soldiers load data on the impact of performance.

Major Ezell's "Battlefield Mobility and the Soldier's Load" presents a detailed analysis of how loads affect tactical performance. To complement this data is a study done by J. Knapik, J. Staab, M. Bahrke, J. O'Connor, and M. Sharp of the Army Research Institute on the "Relationship of Soldier Load Carriage to Physiological Factors, Military Experience and Mood States." These two works may help define how self-sustaining an Objective Force Warrior can operate in terms of days of supply and distance from a support element. Reaction and response times are critically affected by soldiers load.

Soldier loads become unit loads, which affect the reaction of the entire organization. If a unit is so overburdened with equipment that "enhances" its lethality that it becomes unresponsive and incapable of reacting to enemy threats, then the enemy will gain and maintain the initiative. Another consideration is the combat effectiveness of an unit outfitted with OF equipment who has to move a few hundred kilometers over rough terrain with excessive loads of extra batteries. This is another situation where the enemy will gain and maintain the initiative because the friendly force may be too tired to act.

This review is not a comprehensive list of all works cited, but offers the major pillars in setting the foundation for the analysis of the thesis question. Critical in understanding the questions asked is defining the OF, its capabilities, and controlling guidance. By understanding these areas through the application of a research methodology, meaningful analysis and relevant conclusions can be drawn. These will be examined in chapter 3.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter discusses the analytical approach used to "arrive at a dependable solution" to the research question. This method is most accurately characterized as a descriptive comparison form of research. The organization of this research method logically follows the five-chapter approach presented by this thesis. The process consisted of gathering facts, evidence, and performing analysis. The culminations of these processes are presented as recommendations and conclusions.

This study is based on Gary Moore's research model, *Developing and Evaluating Educational Research*. This thesis will present a seven-step methodology:

Step 1: Identification and Isolation of the Problem

Step 2: Development of a Hypothesis

Step 3: Collection and Classification of Sources

Step 4: Identification of Current State of the Variables

Step 5: Organization of Facts into Results

Step 6: Formation of Conclusions

Step 7: Synthesis and Presentation in an Organized Form

Step 1: Identification and Isolation of the Problem

The research question was formulated to examine the internal processes that drive the need and ability of a military force to transform over a given time period to meet projected enemy threat capabilities. This central issue was further examined and structured as a primary research question based on critical issues linking force

transformation, as detailed by the *Operational Requirements Documents for the Future Combat System* (ORD) and the Objective Force *Operational and Organizational Plan for the Unit of Action* (O&O), to a final product ready for fielding to combat units at the project fielding date. Isolating the issues led to the following structure of primary, secondary, and tertiary questions.

Primary Question

What Objective Force Warrior fielding options will allow the U.S. Army the best solution to maintain force readiness while maintaining the capability to fight asymmetrical threats across the full spectrum of conflict?

Secondary Questions

1. Why does the Army need the L/Objective Force Warrior?
2. What aspects of doctrine, tactics, and leadership must be adjusted to incorporate the technological advancements of the warrior systems?
3. Will technological evolution meet development and fielding timelines?

Step 2: Development of a Hypothesis

The primary research question must account for several factors that relate to the secondary questions. First of all, the research question recognizes the fact that transformation has always been a part of the Army's history of self-improvement. However, the Army must be selective about what systems to transform and when is the best time to do so. At the same time, the question recognizes the importance of maintaining a standing force capable of conducting operations in many different parts of

the world as both friend and foe capabilities increase jointly due to greater cohesions of a global economy and technology transference.

The underlying hypothesis is that fielding the Objective Force Warrior with the Unit of Action can reduce the need to deploy large numbers of soldiers for extended periods of time, as well as prevent overwhelming casualties in combat operations due to increased capabilities against an enemy threat. By optimizing capabilities and reducing some of the ad hoc qualities that have characterized past missions, theoretically, available time and training quality should improve to produce a better-prepared military force. To test the hypothesis, this thesis will apply the qualitative analysis to sources detailed in chapter 2 to determine what range of options is most likely to provide the best results for the Army.

Step 3: Collection and Classification of Sources

These informational needs became the focus of the literature review. Included in this step is the collection and classification of sources. For the purpose of this research, these sources have been arranged into three groups. The first group of sources is those which reference specified or implied capabilities of the Objective Force Warrior platform. These are white papers or products of the joint and Army staffs that drive contractors and research and development teams to solve the technical problems in equipment design and capability as needed by military forces. As noted in chapter 1, General Shinseki's vision statement was the initialization of the Objective Force concept.

The second group of works is composed of documents that track the development of the infantry squad and platoon's current capabilities, strengths, and weaknesses. More than physical tangibles, such as pounds of equipment or speed of movement, references

to leader development, psychological effect of soldier's load on mission accomplishment, and the cost/benefit of maintaining situational awareness at the expense of information overload must also be considered.

The third group of works is composed of references that outline the Revolution in Military Affairs theories as described in chapter 2. These documents provide enough information to theorize whether technology will meet the demands of the anticipated capabilities of the OF.

Step 4: Identification of Current State of the Variables

A focused literature review was performed to determine the availability of information to meet the needs of the secondary questions. This step resulted in the verification of available information, as well as the links between the secondary and tertiary research questions. This step was critical in the determination of the current state of the variables needed later in the research process for deriving conclusion and recommendations to the stated problem.

Step 5: Organization of Facts into Results

This step of the qualitative model is the organization of facts into results. In this step facts will be gathered from the sources collected to determine relationships between those facts. The relationships will then yield results that will help determine conclusions. For example, if one source offers an option for force structure, but a preponderance of other sources refutes the efficacy of that option, the research will have established a relationship that can yield a conclusion. Another way of establishing a relationship is to

find a historical example of where certain ranges of options have been tried and to analyze the outcome of those previous experiences.

Instruments to Be Used

Several instruments will be used in the organization of facts into results. The first instrument that will be applied to a particular range of options is screening criteria. This qualitative analysis will apply the following screening criteria against any range of options:

1. Will this option degrade the ability of the force to deter and defeat enemy forces?

2. Will this option fail to meet guidance as outlined in the *Operational and Organizational Plan for Maneuver Unit of Action*?

3. Will this option fail to meet guidance as outlined in the Operational Requirements Document for Future Combat Systems?

If the answer of any of those questions is yes, then that range of options will not be considered viable and will be eliminated.

The second instrument this study will use is decision criteria based on guidance as outlined in the ORD and budget estimates. Each range of options will be evaluated using the following five decision criteria. Table 1 captures this data in a Decision Matrix Shell. The bracketed numbers indicate specific objectives as named in the Operational Requirements Document.

1. Command, Control, Communications, Computers (C4), and Leadership: Future Combat System must provide the soldier with an increased ability to receive and process information provided by command, control, communications, computers, intelligence,

surveillance, and reconnaissance (C4ISR) tools within the OF and FCS. Soldier C4ISR, situational awareness (SA) and situational understanding (SU) will provide an enhanced knowledge of individual tasks and missions, a common operating picture (COP), and the ability for rapid exchange of pertinent information across the full spectrum of military operations, enhancing the agility of the soldier and soldier Team. FCS must enable mission planning, rehearsal, and dissemination of information to the Soldier and Soldier team [ORD 3476]. Agility and versatility are key parts of C4 and leadership: Agility allows future forces to transition from stability or support operation to war fighting and back. Agility is a function of initiative and speed and is enabled by information technology. Versatility describes the inherent capacity of Objective Force formation to dominate at any point on the spectrum of military operations (Shinseki 2001). Will this option provide enhanced C4ISR, SA, and SU to the infantry squad? This criterion will be assigned a value based on whether the option being considered will be: (1) very capable, (2) likely capable, or (3) marginally capable.

2. Lethality: FCS FoS must provide the soldier the capability, mounted and dismounted, to detect, identify, and counter--or achieve desired effects against--designated targets throughout the full spectrum of military operations defeating the enemy, at the time and place of his choosing [ORD 3214]. Will this option provide enhanced lethality to the infantry squad? This criterion will be assigned a value based on whether the option being considered will be: (1) very likely, (2) likely, or (3) not likely.

3. Full-Spectrum Integrated Protection with Enhanced Multifunctionality: FCS FoS must provide the soldier effective protective countermeasures and survivability within the full spectrum of military operations, under all climatic conditions, and in all operational

environments [ORD 3216]. Objective Force survivability will be linked to its inherently offensive orientation, as well as its speed and lethality. By seizing the initiative and seeing, understanding, and acting first, the Objective Force will enhance its own survivability through action and its retention of the initiative (Shinsekì 2001). Will this option provide enhanced full-spectrum capability to the infantry squad in a reasonable time frame to meet increasing enemy capabilities? This criterion will be assigned a value based on whether the option being considered will be: (1) very likely, (2) likely, or (3) not likely.

4. Training: FCS FoS must integrate with the requisite Land Warrior / Objective Force Warrior Training Aids, Devices, Simulators and Simulations, so that training with Objective Force systems will best replicate the full spectrum of operations including dismounted, mounted, dismounted supported by mounted, and mounted supported by dismounted [ORD 3478]. Will this option provide an enhanced training environment where leaders and soldiers can train and integrate equipment upgrades into current unit training and exercise programs? This criterion will be assigned a value based on whether the option being considered will be: (1) very likely, (2) likely, or (3) not likely.

5. Developmental and Fielding Cost: It is obvious, the less-expensive a system is to research, develop, and field, the more likely it will be met with political approval and continued funding. Will this option meet political approval given current military budget constraints? This criterion will be assigned a value based on whether the option being considered will be: (1) very likely, (2) likely, or (3) not likely.

Table 1. Decision Matrix Shell for Objective Force Warrior Options					
Options	C4/Leadership	Lethality	Full-Spectrum Compliance	Training	Cost
Option 1: Field Objective Force Warrior in 2008 as a component upgrade to the LW: Transfer R&D from Objective Force Warrior into LW	1-Very Capable 2-Likely Capable 3-Marginally Capable	1-Very likely 2-Likely 3-Not likely	1-Very likely 2-Likely 3-Not likely	1-Very likely 2-Likely 3-Not likely	1-Very likely 2-Likely 3-Not likely
Option 2: Field Objective Force Warrior NLT 2008 Continue Fielding LW by 2004	1-Very Capable 2-Likely Capable 3-Marginally Capable	1-Very likely 2-Likely 3-Not likely	1-Very likely 2-Likely 3-Not likely	1-Very likely 2-Likely 3-Not likely	1-Very likely 2-Likely 3-Not likely
Option 3: Delay Objective Force Warrior until 2018 Continue Fielding LW by 2004	1-Very Capable 2-Likely Capable 3-Marginally Capable	1-Very likely 2-Likely 3-Not likely	1-Very likely 2-Likely 3-Not likely	1-Very likely 2-Likely 3-Not likely	1-Very likely 2-Likely 3-Not likely

Note: Lower number indicated better capability.

Step 6: Formation of Conclusions

Table 1 also demonstrates the process that will be used to form conclusions based on the facts derived from various sources in steps 4 and 5. Each range of options will be analyzed using the screening criteria and decision criteria outlined in step 5. Conclusions will be based on the credibility and weight of supporting evidence in the existing literature. The values have been assigned so that lower totals are preferred. The best option will be the one with the lowest total.

Step 7: Synthesis and Presentation in an Organized Form

The discussion of conclusions will be presented in a topic outline format. The topic outline will be roughly analogous to the familiar military decision-making process, appropriate for the audience. The outline will discuss each option as a course of action. The discussion will center on the advantages and disadvantages of each course of action. Each course of action will then be evaluated on whether or not it meets the screening criteria discussed earlier. If a course of action fails to meet the screening criteria, it will be eliminated from consideration. Finally, each course of action will be evaluated using the decision criteria. The course of action that comes closest to meeting all three criteria will become the recommended course of action.

In the next chapter, the research design that has been outlined in the preceding pages will be applied. While the research design is focused on assessing broad concepts, much of the following chapter will also focus on refining the broad concepts into more distinguished options in order to arrive at solutions that are more feasible. In other words, research may determine that one or more concepts are not politically feasible. However, specific refinements of those options, while not discussed in the existing literature, may provide solutions, that are more acceptable to Army policy makers. This refinement of options will, in effect, contribute to the existing body of works on the topic and may ultimately provide topics for further study.

CHAPTER 4

ANALYSIS

Armed forces execute dominating maneuver when they successfully exploit technology, organization, training, and leadership to attain qualitatively superior fighting power as well as dramatic positional advantages in time and space which the enemy's countermeasures cannot defeat. (1997, 37)

Colonel Douglas A. Macgregor

This chapter highlights the analysis of data gathered to answer the primary research question. This chapter fuses the data collected from the literature reviewed in chapter 2 with the detailed research method of chapter 3. This synthesis allows preliminary derivations of the secondary and tertiary questions. Furthermore, they offer support to the research model and the selected options outlined in chapter 3.

The Army's vision for the Objective Force Warrior is of a highly lethal, survivable, networked soldier within a small combat team operating across a spectrum of future Army operations. The soldier will be equipped with self-protection gear, a range of weapons of varying lethality, and information management. The Objective Force Warrior will use assets, such as robotic cargo transporters (called "mules"), networked sensor fields, and unmanned air vehicles. These capabilities will be compatible with the Army's FCS program now in development (General Dynamics Corp, 2002).

The *Operational Requirements Document for Future Combat Systems* describes the infantry squad as an entity that fights using combined arms integration assets that are both organic and not organic to the squad. They will have the ability to conduct dismounted maneuver while not in physical or visual contact with other squad members, yet they will know the location of fellow team members. The FCS will provide the rifle

fire team and squad, situational awareness, and communications architecture. It further describes that everything the soldier wears, carries, consumes, and operates in the execution of tasks and duties will be treated as an integrated system of systems. The FCS soldier as a system meets the need to improve the current capability of all Soldiers, regardless of skill training, to perform Army common tasks and functions more efficiently and effectively (ORD 2002, C-1).

The focus of the Objective Force Warrior, as demonstrated in the preceding paragraphs, is the infantry soldier and squad. The current *Operational and Organizational Plan for the Unit of Action* calls for an infantry squad composed of nine soldiers. While squad sizes have been a point of discussion since the end of World War II, squad size has remained at nine soldiers since the late 1980s. Colonel William E. Depuy in a 1958 issue of *Army* reminds the reader that as technology advances and the Army becomes mesmerized with bigger, more lethal weapon systems, it is the infantry squad that is the crucial element. It spends 90 percent of its time moving and only 10 percent fighting. Nevertheless, it has two chief requirements--to kill and to advance (Recapitulation of the Infantry Squad 1997, 8).

It is difficult to assess the capabilities of an infantry squad using the Objective Force Warrior when the system is still in the concept stages of research and development. Instead, it is more feasible to look at tests of the LW system in order to gage the potential effectiveness of the Objective Force Warrior. Examination of the LW system provides a basic understanding that will assist in evaluating the implications of selecting option 1 from the decision matrix.

For practical purposes, the Objective Force Warrior is the offspring of the LW. This means that the Objective Force Warrior and LW carry the same basic underlining concept of integrated systems. However, the biggest difference lies in the acquisition process. The LW represents a major push by the Army to use commercially available off-the-shelf components to decrease developmental costs and expedite fielding timelines. The LW weapon subsystem integrates target acquisition sights and devices: the close combat optic, the AN/PAQ-4C aiming laser, and the thermal weapon sight into a complex aiming and communications subsystem. Since the systems are meshed together, weight, wearing configuration, and battery life are its chief criticisms.

The Army Research Institute conducted a marksmanship test of the LW system with an 82nd Airborne Platoon in December 1998. When compared to a control platoon with identical composition and no LW equipment, the LW platoon showed greater accuracy in a variety of tests. The LW platoon was able to qualify considerably well at night, compared to their counterparts. This was due to a combination use of night vision goggles, aiming lasers, and close combat optics. Collected data also showed that the LW platoon was more lethal during limited visibility firing exercises on target ranges from static positions. They received a greater number of scored hits across all assigned and tested weapon systems. However, the special devices did not compensate for poor marksmanship skill on the M4 carbine, M249 squad automatic weapon, or the M240B machine gun (Dyer 1999, 50-58).

Other tests were performed on the system to provide feedback on design and effectiveness of the LW prototypes. A platoon from the 3-325th Infantry used the LW in September 2000 at the Joint Readiness Training Center. It was still assigned to its parent

company for the rotation. The platoon conducted a night assault and a search and attack mission over a 72-hour time period. The platoon was then transitioned into a live-fire mission, urban attack in a small civilian town environment, and ambush operations.

The platoon conducted a night airborne assault. Once on the airport drop zone, it assembled 50 percent faster than its fellow platoons, due to GPS and digital map capabilities. Once the Land Warrior equipment was placed into operation after the parachute jump, the platoon was capable of seeing the terrain and all other platoon members in the heads up display (HUD). This translated to faster movement into the platoon's assigned area without receiving hostile fires as they moved toward their mission objective. The translucent HUD provided a digital map and the ability to identify routes while moving quickly--the HUD covered one eye while the night vision goggle covered the other. The ability to see the digital terrain and select routes prevented the platoon's exposure as an idle target to enemy assaults. The platoon was able to move well dispersed at night and still maintain effective command and control. The lead fire team was 350 meters in front of the squad leader. This distance was far greater than that of most daylight fire team movements (Burch 2001, 8).

When encountered by a sniper team, the platoon had three casualties while easily maneuvering using thermal sights to kill the sniper team who had little or no night vision capability. This sniper team, under normal JRTC condition, would have rendered a normal platoon combat ineffective. The HUD of the LW made all of its members more situational aware. This readily available, digital information may have prevented fratricide during the sniper attack. However, soldiers using the HUD and night vision combination for more than three hours of continuous operation often required additional

rest due to eye strain and mental fatigue. In its evaluated configuration, the LW weighed thirteen pounds alone and between twenty and twenty-five pounds with additional batteries. Additional LW equipment accounted for approximately 20 to 30 percent increases in soldier load where movements were between two and four kilometers. The increased weight load also increased water consumption (Burch 2001, 19).

Soldier load is always a point of discussion for infantry units when packing for field exercise or combat missions. Modern infantry units were not the first to wrestle with this issue. Roman legionnaires carried eighty-pound loads on their long spiked stakes, and Byzantine infantryman, who used carts and pack horses, still carried a similar load. During the French campaign in North Africa, their Foreign Legion marched twenty-five miles a day with one-hundred-pound packs (Ezell 1992).

As reported by Inside the Army, Scott Myers, Project manager for the LW, revealed that there are four or five main things that have to be achieved under Objective Force Warrior, the first being about a ten-time increase in effectiveness for the platoon, including lethality and survivability over the present system. The way to achieve that kind of improvement is to use increased situational awareness and netted communications, which right now does not exist at this level. Individual dismounted soldiers are given the ability to communicate with a network-centric approach. Another key issue to come out of this is to lighten the soldier's load. Now he carries one hundred pounds and the Army wants to lower it to forty-five pounds (Gourley 2002).

To ensure that U.S. forces possess the speed and agility necessary to concentrate and win on tomorrow's battlefields, the infantry must reduce its loads to those items necessary and essential for combat and survival. Given the LW and Objective Force

Warrior's requirement for battery power, it seems that until batteries can last longer and weight less, advances in light infantry equipment often equates to heavier loads. Analyzing the soldier's load physiologically raises the question of what is the physical load-carrying capacity of the average soldier.

The Marine Corps and Army collaborated research to identify problems associated with overloading soldiers in combat operations. The study identified minimum and maximum weights that could be carried by combat-committed Marines, while still retaining some degree of combat effectiveness. The result, a soldier was most effective when the load was between 30 and 45 percent of the individual's body weight. For the average soldier, this was approximately forty-eight pounds not to exceed seventy-two pounds. Research further indicated that training can only improve load-carrying capability by 10 to 20 percent. It is important to note that these loads vary from soldier to soldier. Temperature also affects the ability of a soldier to endure under the same load weight (Ezell 1992).

To provide further analysis and insight into each fielding option, a review of each option and its chief components based on theory, characteristics, and congruence with selected criteria is presented.

Option 1: Cancel Objective Force Warrior: Field LW by 2004 Transfer R&D from Objective Force Warrior into LW

General: This option suggests that the Army will not be able to meet the anticipated fielding of the Objective Force Warrior by 2008. Given this condition, it is more beneficial to pursue this option rather than delay beyond 2008. Land Warrior will be the first integrated soldier fighting system to connect the soldier to the digitized

battlefield. The equipment, like the Objective Force Warrior, is supposed to increase a soldier's situational awareness while allowing more protection than today's conventional gear. The current plan is to buy and field 34,000 of these systems. According to Colonel Hank Kinnison, Land Warrior is being built for the "rifle squad in close contact at two o'clock in the morning, in a driving rain storm with a stubborn enemy shooting back and rapidly moving against their positions." Col. Kinnison is the Training and Doctrine Command's (TRADOC) systems manager for soldiers at Fort Benning, Georgia (Erwin 1999).

Supporting Revolution in Military Affairs Theory: Many Revolution in Military Affairs proponents have begun to argue for major changes in Pentagon budgetary priorities to free up resources and pursue military transformation. This option supports the Revolution in Military Affairs vulnerability theory. If this theory holds true, adversaries will equally benefit from technological growth. Therefore, it is better to invest in science and technology to improve military forces because the global economy will ensure that the means to acquire technology cannot be circumvented if the will exists. Support of this Revolution in Military Affairs theory also allows more research dollars to be reapportioned from the Objective Force Warrior program into other areas, such as homeland security defense program.

Advantages

1. Resources pooled into unified effort for R & D
2. Technology developed for Objective Force Warrior can be integrated into LW
3. Immediate benefit to infantry force capabilities

Disadvantages

1. Overall decrease in R & D effort for L/Objective Force Warrior programs
2. System may not be fully capable IAW requirements, therefore, require many component upgrades
3. Introducing the system before other FCS FoS may yield unforeseen incompatibilities between systems ability to dock and share data.

Screening Criteria: This option meets all screening criteria. However, adjustments must be made to allow the LW to mature toward Objective Force Warrior capabilities by 2010 as originally designed into the Objective Force Warrior timeline.

Decision Criteria

C4/Leadership: Based on the JRTC 2000 prototype test of the LW, it is fully capable of providing the soldier with an increased ability to receive and process information provided by C4ISR. Even though the test did not include full integration of a battlefield information network, the information shared between members of the same platoon allowed them the ability to out-maneuver the enemy.

Lethality: The LW demonstrated its effectiveness at improving night target acquisition skills and allowing the JRTC platoon to maneuver and kill an enemy sniper team without additional casualties or fratricide. Therefore, this option is very likely to provide the infantryman the capability to defeat the enemy at the time and place of choosing.

Full-Spectrum Compliance: This option will likely provide full-spectrum dominance as the system continues to be upgraded. The current weapons and ammunition types for this option will likely prevent it from total spectrum dominance until it reaches

maturity. This option is also limited by weight and battery requirements, but not to the extent that it would be deemed ineffective.

Training: In its current form the LW represents incremental upgrades to currently fielded equipment. As a result, it is very likely that units can easily integrate training to incorporate and simulate the capabilities of this option without trivializing learning or training objectives for leaders or soldiers. The technology of the LW is similar in design and fashion and function to current computer and simulation systems. Soldiers and leaders will not be required to learn completely new technological skills to operate or maneuver in a battlefield environment.

Cost: Land Warrior's acquisition cost, originally estimated at \$1.4 billion, is now estimated at \$2.1 billion. Adding operations and maintenance costs will bring the lifecycle total to \$3.5 billion. The system was supposed to be fielded in FY 2000--but now it has been delayed until FY 2004. Because the LW was designed with the principle of employing commercial rather than contracted components, the initial production costs were projected to be lower than those of the Objective Force Warrior (Erwin 1999).

Option 2: Field Objective Force Warrior NLT 2008: Continue Fielding LW by 2004

General: Support for this option requires belief in the Army's ability to meet the accelerated project fielding goals. General Shinseki's guidance was to field the Objective Force Warrior by 2010. However, contractors believe that fielding in 2008 is obtainable without compromising design, costs, or capabilities. Since no test system is available to evaluate the decision criteria for this option, analysis is based on the findings of research groups. The goals of these groups were to focus R & D toward a common goal.

Supporting Revolution in Military Affairs Theory: Any option which delays the fielding of military equipment in favor of a better, more capable end product favors the Revolution in Military Affairs theory of system of systems. This theory proposes that computer and technological capabilities will increase at an exponential rate over time. As a result, developers are able to more closely approximate system designs with capabilities.

Advantages

1. More capable and lethal Objective Force Warrior system fielded in 2008
2. Increased technology development will allow the fielding of a smaller, lighter system when compared to LW
3. More available time to integrate projected capabilities to take advantage of digital battlefield operating systems

Disadvantages

1. Infantry units will have to train and transition between two potentially different systems within a four-year period.
2. Separate budgets must be maintained which could lead to cost and production overruns.
3. All capabilities may still be unrealized and in developmental stage due to limit in size, weight, or battery storage capacity.

Screening Criteria: This option meets all screening criteria.

Decision Criteria

C4/Leadership: The Objective Force Warrior will focus on collaborative situational awareness. This system will allow automatic transmission of sensor, communications, and status information across the area of operation and across all tactical, operational, and strategic levels. As a result, orders and changes in orders can be instantaneously transmitted to squads and platoons. This real-time tasking ability will influence how leaders employ direct and artillery fires, as well as how small units maneuver and against the enemy.

Lethality: To fight over greater distances for extended periods of time, the Objective Force Warrior will weigh no more than forty pounds. To assist in carrying heavier loads, a robotic load bearing system will carry additional equipment, such as ammunition and water. Weapons with thermal and laser sites, multipurpose selectable ammunition, and improved optical scopes will allow the enemy to be killed at greater distances.

Full-Spectrum Compliance: The protective suite of the Objective Force Warrior will provide protection from ballistic, chemical, and biological threats. Selectable ammunition will allow a unit to operate in peacekeeping environments with nonlethal methods across the entire spectrum of conflict--one weapon, able to handle multiple threat levels.

Training: The Objective Force Warrior itself will contain embedded individual and collective training simulations with visualization software. The system will also have the ability to load mission rehearsal data. Once loaded, a squad, platoon, or even

company will possess the ability to conduct full-virtualized rehearsals without wasting time building elaborate terrain models.

Cost: The Objective Force Warrior program will provide the core network-centric system deployed by dismounted soldiers in the year 2008. The \$7.5 million contract is for an eight-month concept development phase. Future phases have a potential value of \$145 million over five years (Gourley 2002).

Option 3: Delay Objective Force Warrior until 2018: Continue Fielding LW by 2004

General: Delaying the introduction of the Objective Force Warrior until 2018 allows overwhelming overmatching of Objective Force Warrior capability as compared to the projected threat potential. Full collaborative situational understanding can be achieved. The next generation of smart ammunitions and weapons will increase lethality. Lighter protective material will increase survivability while reducing weight. Power sources will be miniaturized so that they may conform to body contour or even integrate to become additional body armor. Virtual training will remain the readiness tool of choice with added ability to train battalions and brigade combat teams in full simulations with wheeled, tracked, and aviation vehicles. Enhanced environmental protection will allow soldiers to operate in any contaminated environment. Even when injured, the Objective Force Warrior will stabilize life support until evacuation to a medical facility.

Supporting Revolution in Military Affairs Theory: Like option two, this option supports the system of systems Revolution in Military Affairs theory. The chief premise behind delaying the Objective Force Warrior until 2018 is that it timelines the next technology threshold such that critical advances in technology will allow complete

implementation of the Objective Force Warrior into the OF without constant spending on modular upgrades to keep the system compatible with the FCS.

Advantages

1. System is deployed at its maturity
2. Compatibility with FCS and digital systems across the battlefield is assured
3. Capability increased twenty times that of the Land Warrior

Disadvantages:

1. Infantry soldiers may be left vulnerable until system is fielded.
2. Unit training on new equipment will not be possible until prototypes are complete.
3. Budget costs may escalate without fielded products to provide focus and feedback. The Comanche helicopter program is an example where continuous budget overruns have not produced a complete product within the allocated timeline. It was planned an interim force scout vehicle, now it has been rolled into the Objective Force FCS family.

Screening Criteria: This option does not meet the first and third screening requirements. It fails both of these requirements because it may potentially leave infantry forces unprepared to face future conflicts in which threat forces have produced and are capable of fielding battlefield systems capable of defeating the Objective Force Warrior before 2018. This option fails the third screening criteria because the ORD requires all components of the Objective Force to be fielded by 2010. Even though the best system capability will be achieved beyond 2010, this option violates the program timeline

designed into Army transition milestones. Because this option violates the screening criteria it cannot compete as a viable option for fielding the Objective Force Warrior.

Grading the Options:

Based on the research method presented in chapter 3, two of the three options met the screening criteria. The decision matrix (table 2) summarizes the assessment of each option based on the decision criteria. In the decision matrix, all criteria have equal weight.

By inspection of the decision criteria, it can be seen that fielding the Objective Force Warrior as a component upgrade to the LW is the better option for the Army. This allows for both programs to be merged, such that the research and development of the science and technology can be pooled into one program with one direction. While option 2 is likely to produce a system with a better technological edge, it is unlikely that a working model will be fielded on time. This in the long run will affect program costs and unit readiness.

Table 2. Evaluated Decision Matrix Shell for Objective Force Warrior Options						
Options *	C4/Leadership	Lethality	Full Spectrum Compliance	Training	Cost	Total
Option 1: Field Objective Force Warrior in 2008 as a component upgrade to the LW: Transfer R&D from Objective Force Warrior into LW	2-Likely Capable	2-Likely	2-Likely	1-Very likely	1-Very likely	8
Option 2: Field Objective Force Warrior NLT 2008 Continue Fielding LW by 2004	1-Very Capable	2-Likely	2-Likely	2-Likely	2-Likely	9
Option 3: Delay Objective Force Warrior until 2018 Continue Fielding LW by 2004	1-Very Capable	1-Very likely	1-Very likely	3-Not likely	3-Not likely	9

Note: Lower number indicated better capability.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATION

A review of the existing literature revealed three primary options available to the Army in implementing the Objective Force Warrior system. These options can be summed up in a matter of three choices: Field the Objective Force Warrior on schedule, beyond schedule, or rededicate resources to other projects. The *Operational Requirements Document for Future Combat Systems* details system requirements for the development of the Objective Force Warrior. The *Operational and Organizational Plan for the Unit of Action*, on the other hand, issues appropriate guidance to develop doctrine, organizations, training, materiel, leadership and education, personnel, and facilities to employ Objective Force units in combat and support roles around the world. When combined with the *U. S. Army White Paper: Concepts for the Objective Force*, a complete concept is outlined for the development of the Objective Force Warrior. Screening and decision criteria were developed based on these concepts. Fielding options not passing the screening criteria were dismissed. This left two options to be measured against the decision criteria.

The central question of this thesis has been: What Objective Force Warrior fielding options will allow the U.S. Army the best solution to maintain force readiness while maintaining the capability to fight asymmetrical threats across the full spectrum of conflict? While specific recommendations will be offered later in this chapter to answer the primary question, this thesis will first attempt to draw conclusions based on the secondary questions posed in chapter 1. These questions were:

1. Why does the Army need the Land /Objective Force Warrior?

The long-term goal of the Objective Force is to dominate, as part of a joint force, the future battlefield through integration and effective, concentrated firepower. The FCS, scheduled for initial fielding in 2008, will exploit the total battlefield picture, integrating the combatants and commanders, while concentrating overwhelming power against enemy forces. More than communicating the situation and reacting as it unfolds, FCS will allow disparate elements to see the same targets, to determine enemy actions beyond the line of sight and prevent tactical surprise or strategic defeat. FCS will permit commanders to shape the battlefield in advance. The Objective Force Warrior, an integral part of the FCS, uses technology to boost human performance. In distributing and receiving real-time battlefield information through Objective Force Warrior, the infantry soldier remains a honed weapon but also becomes both a platform and a system for integrated sensors. Downsizing has had a dramatic effect on Army force structure and readiness. The Objective Force Warrior is a combat multiplier that will allow infantry units to be more effective given current force structure and continued global deployment requirements.

2. What aspects of doctrine, tactics, and leadership must be adjusted to incorporate the technological advancements of the warrior systems?

The Army faces a range of threats in a multitude of environments. Rapid, informed actions using calculated and proportionate force are perquisites for victories in future combat scenarios. Army Transformation seeks to dominate the field by employing a combined capability of superior information flow, dominant battlefield awareness, top-tier hardware, and most important, the soldiers to execute the missions.

The JRTC experiment of the LW showed that tactics were unaffected by day or night operations. Digital maps and global positioning satellite data provide improved land navigation and situational awareness. The individual communications system, although exhibiting problems, did aid in command and control of the squads. The soldiers used thinner, lighter body armor. Although unevaluated, statistics show that body armor of any grade increases survivability and mitigates some types of combat injuries. The LW was able to create a more favorable condition to the attacking infantry soldiers so that this ratio was not always required to gain and maintain fire and maneuver superiority. At this time, no conclusion can be drawn to warrant changes in infantry squad or platoon structure. However, weight and battery storage capacity remain the central issues surrounding man-portable systems like the LW.

3. Will technological evolution meet development and fielding timelines?

Better technology and associated breakthroughs in tactics and operations will certainly help U.S. forces in infantry combat settings. Night vision, helicopter mobility, advanced armored vehicles, and body armor are among the key capabilities that have led to recent American successes in infantry battles. Over the next two decades technologies will allow many of the capabilities of the Objective Force Warrior to become realized. However, several major problems for a highly technological force will remain.

Battlefield transportation is unlikely to change rapidly in the next twenty years for the infantry soldiers. Armor protection will always compete with weight, engine horsepower, and vehicle speed. The armor will become tougher and lighter. Vehicles are likely to become safer in their ability to transport infantry troops. New materials and the better use of items like Kevlar will make troop carriers more resistant to land mines and

blast explosions. However, enemy forces will have enhanced missiles with the capability to defeat advanced armor with one shot (O'Hanlon 2000, 113).

New technology associated with tactical and operation innovations will make important contribution by 2020. But it is clear that many fundamental limitations will be hard or impossible to overcome. That means combat will, in many ways, be similar in 2020 to its current nature. This also doubts that the U.S. military is under any major transformation or revolution in military affairs. Infantry combat will likely remain difficult and unpredictable. The propagation of technology cannot be limited to one nation or a single army.

Conclusions

The answer to the primary research question was accomplished by the criteria presented in table 2. Option 1: Field Objective Force Warrior in 2008 as a component upgrade to the LW: Transfer R&D from Objective Force Warrior into LW presents the best combination of characteristics to continue the development of Objective Force Warrior technology, while providing the legacy, interim, and objective Army forces immediate access to benefits of improved systems. The largest factor influencing all options was the element of cost. The Army announced in the summer of 2002 that fourteen programs associated with the Legacy Force, including major systems, such as the M2A3 Bradley and the M1A2 Abrams system enhancement program will be cut in its next six-year spending plan. The terminations, along with the restructuring of six other programs, are necessary to pay for development and fielding of Objective Force programs. This allows the Army to recoup \$12 billion from the changes. As reported by Inside the Army, General Keane, Army Vice Chief of Staff, stated that more programs

are scheduled for shutdown in order to fully fund the FCS between fiscal years 2004 and 2009 (Winograd 2002). Even though Option 1 pertains to a particular aspect of the OF program, it allows the Army to be more selective about which Legacy Force programs it will continue by easing the budget expense associated with separate Objective Force Warrior and LW program development.

Another critical aspect of selecting option 1 was the ability of the Army to continue its current readiness levels, while continuing development to meet anticipated future threats. There is no silence or stealth cloak surrounding the capabilities of the U. S. military prowess. Through media sources, such as CNN, the world has witnessed the capabilities of a first-rate military force. The shift from the bipolar world of the Cold War to a multipolar global economy has forced the U.S. to revisit its roles in world order and global politics. In short, the U.S. military has become, to a certain extent, an international police--filling in when the United Nations cannot or will not act. Right, wrong, or indifferent, U.S. actions have inspired new allies, as well as new enemies. The events of 11 September 2001 have shown that an enemy does not have to be technologically superior or highly organized, just resourceful and skillful enough to meet its mission goals. This causes new issues that must be considered when transforming the Army into the Objective Force. What is the new threat and what are its capabilities? The decisive factors directly related to this question are the need to be full spectrum-compliant, while possessing the ability to continue to educate and train the force throughout the fielding process.

Option 1 allows developers to gradually upgrade the capabilities of the LW to approach those of the Objective Force Warrior without being locked into a steadfast

design approach. As system performance, technological innovations, or enemy threat capacity evolve, then developers can implement soldier feedback and capability requirements into the next block upgrade. This ensures that the life of the system will be preserved while allowing the active force to transition from Legacy to Objective as technological improvements become available.

While this thesis was being researched and written, the Army changed its fielding plan for the Objective Force Warrior. As published by *Inside the Army in January 2003*, the Army has scrapped plans to field the Objective Force Warrior with the first block of the FCS in fiscal year 2008. As a result officials have decided to trim millions of dollars from the science and technology budget of the six-year budget of the Program Objective Memorandum.

Instead of using fielding the Objective Force Warrior as a subcomponent of the FCS program, the Army will pursue the LW as an alternative. When General Shinseki accelerated the FCS schedule from 2012 to 2008, it caused schedule issues by desynchronizing product design, capability, and research goals. Now, the Army intends to field the first version of the Land Warrior termed Land Warrior Initial Capability. Although units, such as the Army Rangers and 82nd Airborne Division, have tested prototypes of the LW, Army Rangers are the only units scheduled to receive initial shipments in fiscal year 2004.

The Land Warrior Stryker Interoperability (LWSI), will go to the Army's Stryker Brigade Combat Teams. This is the second version of the LW and will focus on interoperability at brigade and below levels of command and control. For example,

soldiers equipped with the LWSI will be able to plug into the Stryker vehicles access port to receive power, battery recharging, and updated battlefield data.

In 2008, to accommodate the vacancy left by the Objective Force Warrior, the LWSI+ will be fielded as part of the FCS. The “plus” is still undefined at this time, but could involve new data bus structure and battery storage power packs to match those of the FCS. Other expected equipment includes a new rifle capable of direct and indirect fire, a joint tactical radio system, and improved night vision devices. A fourth system, named the Land Warrior Advanced Capability, will be fielded with FCS Block II sometime between 2012 and 2015--the original timeline of the Objective Force Warrior (Winograd 2003).

Recommendations

The thesis recommendations are congruent with the path the Army has taken to implement the LWS. Incremental upgrades to the base system offer the most flexibility for future development. The OFW should remain the science and technology base of the warrior program. As early as possible, developments from the Objective Force Warrior should not only be adapted to the LW, but also to other military service objective force systems such that joint interoperability issues are solved before they become challenges to integrating joint assets on the future digital battlefield.

REFERENCE LIST

- Bourgeois, Steven A., Colonel. 2002. The Objective Force and Logistics Force Protection. *Army Logistician* 34, no. 5 (September): 34.
- Burch, Glenn. L., Army War College 2001. An Examination of Land Warrior's Contribution to Combat Power on the Battlefield. Army War College, Carlisle Barracks, PA, 10 April.
- Centric, J. H., R. L. Wampler, and J. L. Dyer. 2000 Observations of Infantry Courses: Implications for Land Warrior (LW) training. TRW Systems and Information Technology Group, Reston, VA, January.
- Clausewitz, Carl von. *On War*. Translated and edited by M. Howard and P. Paret. Princeton, NJ: Princeton University Press, 1984.
- Conley, Mark A. 1994. Enhanced Land Warrior Program. *Army Times* 84, no. 2: 20.
- Cox, Matthew. 2000. Land Warrior: It's on its way. It here to stay. And it could forever change the infantry. *Army Times* 60, no. 32: 18.
- _____. 2000. We'll Take It. *Army Times* 61, no. 8: 14.
- _____. 2002. Officials to Test Improved Land Warrior System. *Army Times* 61, no. 44: 15.
- _____. 2002. So Cool. *Army Times* 62, no. 49: 14.
- Department of Defense. 2002. *The United States Army Objective Force: Operational and Organizational Plan for Maneuver Unit of Action*. Fort Monroe, VA: United States Government Printing Office, November.
- Department of Defense. 2002. *Operational Requirements Document for the Future Combat Systems*. Fort Knox, KY: United States Government Printing Office, November.
- Department of the Army 2001. FM 1-0, *The Army*. Washington, D.C.: United States Government Printing Office
- Department of the Army. 2001. FM 3-0, *Operations*. Washington, D.C.: United States Government Printing Office
- Depuy, William E., and Richard M. Swain. 1994. *Selected Papers of General William E. Depuy: First Commander, U.S. Army Training and Doctrine Commander, 1 July 1973*. Ft. Leavenworth, KS: Combat Studies Institute, U.S. Army Command and General Staff College.

- Dyer, J. L. 1999. Training Lessons Learned on Sights and Devices in the Land Warrior (LW) Weapon Subsystem. Army Research Institute Field Unit, Fort Benning, GA, November.
- Eaton, Paul D., Major General. 2002. Commandant's Note. *Infantry* 91, no. 1: 1.
- Erwin, Sandra I., 1999 Lighter Load is Cyber-Soldier Dream: Infantry modernization program seeks replacement for bulky batteries. *National Defense Magazine*. On Internet: <http://www.nationaldefensemagazine.org/article.cfm?Id=112>. Accessed October 2002
- Ezell, William L., Major. 1992. Battlefield Mobility and the Soldier's Load. Marine Corps University, Command and Staff College, VA.
- FM 3. 2001. *See* Department of the Army. 2001.
- General Dynamics Corporation. 2002. General Dynamics Awarded Army's Objective Force Warrior Agreement, On Internet: http://www.gd.com/news/press_releases/2002/GraphicsNews%20Release%20-Friday,%20August%2030,%202002.htm, Accessed October 2002
- Gourley, Scott R. 2002. Objective Force Warrior. *Army Magazine*, November. On Internet: <http://www.ansa.org/852569B2007822AA.nsf/0/1CB391B98F42E7E885256C560063BA72?Open>. Accessed October 2002
- Hannah, Amy, Major. 2002. Army Announces Objective Force Warrior Lead Technology Integrators. U.S. Army News Release, APA, Washington, DC, August.
- Knapik, J; J. Staab, M. Bahrke, J. O'Connor, and M. Sharp. 1990. Relationship of Soldier Load Carriage to Physiological Factors, Military Experience and Mood States. Army Research Institute of Environmental Medicine, Natick, MA, May.
- Land Warrior: Under New Management. 2003. *Military Information Technology* 4 (6 February): 27.
- Macgregor, Col. Douglas A. 1997. Breaking the Phalanx: A New Design for Landpower in the Twenty-First Century. Westport: Praeger.
- Matsumura, John, Randall Steeb, John Gordon, Russell Glenn, Tom Herbert, and Paul Steinberg. 2000. Lightning over Water: Sharpening America's Light Forces for Rapid Reaction Missions. Santa Monica, CA: RAND.
- Moore, Gary W. 1983. Developing and Evaluating Educational Research. Boston: Little Brown and Company.
- Natick Soldier Center. 2002. On Internet: <http://www.natick.army.mil/soldier/WSIT/>. Accessed February 2003

- O'Hanlon, Michael E. 2000. *Technological Change and the Future of Warfare*. Washington, DC: Brookings Institution Press.
- Objective Force Warrior Unveiled 2002. *Army Logistician* 34, no. 5 (September 2002): 50.
- Office of the Secretary of the Army. 1999. *The Army Vision*. Washington, DC: United States Government Printing Office, October.
- Recapitulation of the Infantry Squad and Platoon Organization Studies and Articles. 1997. Article provided by Combat Studies Institute, Fort Benning, Georgia. CD.
- National Security Directorate. 2001. Report of the Deputy Assistant Secretary of the Army (Research and Technology), Objective Force Warrior. Another Look. National Security Directorate, Oak Ridge National Laboratory, December.
- Scaparrotti, Mike. 2000. Land Warrior readied for critical September test. *Army Times* 61, no. 4: 18.
- Senior Defense Officials Hold Defense Department Briefing. 2002. FDCH Political Transcripts, Arlington, VA, May.
- Shinseki, Eric K., General. 2001. *U. S. Army White Paper: Concepts for the Objective Force*. Washington, DC: United States Government Printing Office, November.
- Stouder, Richard L. 2002. Inventing the 21st-Century Soldier. *World & Information*, 17, no. 5 (May 2002): 140.
- The U.S. Army's Transformation to the Objective Force, vol. 2, Executive Summary* 2002. AUSA Conference, Washington DC, August.
- Winograd, Erin Q. 2002. Army Prepares to Kill 14 More Programs to Pay for Objective Force. *Inside the Army*, July.
- _____. 2003. Army Scraps Plans to Field Objective Force Warrior with FCS Block I. *Inside the Army*, January.

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